

GROWING CHRISTMAS TREES

Select the Right Species, Raise the Best Trees,
Market for the Holidays



Patrick White and Lewis Hill

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A Time-Honored Tradition

Christmas trees are among the few traditions that have truly stood the test of time, stretching back centuries yet remaining an important part of modern life. While the gifts under the tree have become increasingly high-tech, the tree — a bit of greenery in the home to brighten up the dark winter season — is a simple custom that has endured. Today's trees have changed, however. Gone are the days of the sparse "Charlie Brown" tree: expectations as to shape, fullness, color, and quality are far more exacting than they once were.

It takes a more sophisticated approach to produce these higher-quality Christmas trees. No longer do farmers simply cut down wild trees to sell during an otherwise slow time of the year. Today, Christmas tree farming is a specialized segment of agriculture that requires the right site, carefully selected tree species, proper pruning and shearing, and adequate fertility and control of weeds and pests to produce trees that will attract customers and return a good price to the grower. Christmas trees of this sort can be grown by huge industrial-scale farms, but also by growers with more modest operations, and even by backyard hobbyists.

At nearly any meeting of Christmas tree growers you'll notice that these farmers tend to be older. While there is a renewed interest in agriculture by younger generations, their focus has been largely on food crops. Christmas tree farming represents a mostly overlooked avenue for younger farmers. For those already established in agriculture, Christmas trees might be added to diversify products. Others might grow Christmas trees to keep busy and generate additional income in retirement. Whatever your motivation, this book will guide you through the steps necessary to create and maintain a successful small to mid-sized Christmas tree operation.

Many growers say that most of what they know was learned from others in the Christmas tree business. State and regional Christmas

tree associations offer meetings at established farms, where you can ask questions, hear presentations from expert researchers, and find out what works, and what doesn't. The National Christmas Tree Association (www.realchristmastrees.org) offers the same educational and networking opportunities on a larger scale. You will find fellow farmers almost universally willing to share their expertise and experiences. The modest annual dues and meeting fees can save thousands of dollars in mistakes. Chances are you will also make some good friends who share your interest in growing Christmas trees. That is part of the fun of being in this business.

The many Christmas trees that decorate homes and businesses come from small farms and from large Christmas tree plantations of thousands of acres. Large-scale operations, particularly in the top-producing states of Oregon, Washington, North Carolina, Pennsylvania, Wisconsin, and Michigan, are multimillion-dollar industrial agriculture businesses that harvest hundreds of thousands of trees each year.

This book is geared more toward smaller-scale tree farmers who might plant and harvest a few hundred to several thousand trees each year, as a hobby that lets them work the land, a sideline to boost their regular income, or a pleasant diversion in retirement. A tree farm can help you make money with interesting outdoor work. It also makes excellent use of fallow land. A field of Christmas trees is attractive and it doesn't block views as a forest does. Such a project is ecologically attractive. According to the National Christmas Tree Association, each acre of trees provides enough daily oxygen for 18 people, aids in erosion control, and gives excellent cover for wildlife.

Getting Started

On paper, growing Christmas trees seems to be the rare agricultural endeavor that is easy and profitable. How can one go wrong with a crop of 1,200 trees on one acre? You might buy seedlings for a little more than \$1 each and sell mature trees in just 6 to 10 years for \$20 or \$40 or more apiece. That is not a bad profit margin for a spare-time activity!

Financials

The bottom line is that, like any business, Christmas tree farming comes with its share of market uncertainties. No one can be sure what the situation will be 10 years from now when this year's seedlings are ready for harvesting. When you weigh the pros and cons of growing any agricultural crop, you always find it a gamble. Working with the many whims of nature is risky and the whims of the buying public can be equally unpredictable. This is not to say that Christmas tree farming isn't rewarding, or that it can't be financially profitable, just that it's not as simple an endeavor as it might seem to those outside the industry.

Small Investment Required

It takes a surprisingly minor initial cash outlay to start a small- to medium-sized Christmas tree project in comparison with the money required for many other agricultural enterprises. The planting stock is relatively inexpensive and only a few essential tools are needed to manage a small plantation. Many of the expenses can be spread over time, as the trees grow. Keep in mind, though, that the first income will also be years in the future.

The wait for the first profits is not much longer, however, than it would be for the first big harvest of apples, walnuts, blueberries, or other similar crops. It is far shorter than waiting for a planting of trees for firewood, timber, or maple syrup to mature.

Annual Harvests vs. a One-Time Bonanza

One common mistake among beginners in the tree business is to plant all their available acreage at once. There are important logistical and

financial reasons to stagger your planting. Trees planted at one time will all need the same amount of shearing and other care at the same time each year, eventually creating a huge bubble of work.

More important, though, is the challenge that a single crop of uniform age creates when it comes time to sell. It can be difficult to find a market for a large number of trees all at once, especially without previous sales experience in the business. Also, your one and only crop could be ready to harvest during a period when there is a surplus of trees that would make it difficult to sell them at any price. Even if they can all be sold at a good price, you will face a huge harvesting job that must be completed within a few short weeks, and you will have to pay big income taxes that year. Then you will be left with no more trees to sell until the next crop matures, perhaps 10 years later.

Planting a portion of your acreage each year provides a steadier annual income and more evenly distributes the work of planting, cutting, shearing, harvesting, and marketing. Staggered planting puts you in a better position to develop relationships with wholesale buyers who want to be certain of a source of trees they can depend on year after year, or meet the desires of choose-and-cut customers who value the tradition of returning to the same farm year after year.

Market Realities

Many new growers look only at the profit potential in Christmas trees: the \$1 seedling miraculously turning into the \$40 tree. It is possible for things to work out in such a rosy fashion. You must not make any mistakes along the way, however, and the weather, markets, and prices must all be favorable. No diseases or insects can wipe out your investment before sales time. And once you start selling your healthy natural product, you'll discover that artificial trees cut deeply into the market for real trees.

Industry at a Glance

Number purchased

Real Christmas trees

Artificial trees

350 million of real Christmas trees currently growing on farms in the U.S.

15,000 of farms growing Christmas trees in the U.S. (more than 100,000 people are employed full- or part-time in the industry)

350,000 of acres of Christmas trees planted in the U.S.

Most popular Christmas tree species are fir, Scotch pine, Virginia pine, and white pine.

Source: National Christmas Tree Association, 2012

Artificial Trees

The first plastic trees looked phony. New models have become very realistic. Most are manufactured in China, and the number being imported into the United States is rising dramatically. While real Christmas trees still outsell artificial versions on a year-to-year basis, the longer lifespan of artificial trees — different sources estimate the average artificial tree is kept for six years — means that, overall, they are found in most of the homes that display Christmas trees.

At the same time, a growing number of ordinances have popped up around the country forbidding natural trees in some buildings because of fears they represent a fire hazard. Also, a new generation of potential customers has arrived with no tradition of enjoying real trees and little concern for whether a tree is fake or real — or whether they have Christmas trees in their homes at all.

Natural Trees: The Sustainable Choice

Christmas tree industry groups have worked regionally and nationally to promote farm-grown Christmas trees as the clear ecological choice over plastic trees manufactured overseas using petroleum products and other chemicals. There have also been many fact-based demonstrations to counter tree bans brought about by fears over fires,

as well as efforts to emphasize the importance of Christmas traditions such as real Christmas trees.

In 2014, at the industry's urging, Congress passed and the president signed legislation creating the Christmas Tree Promotion Board, a national marketing collective meant to duplicate the success of agricultural marketing groups such as the National Dairy Council (famous for the "Got Milk?" campaign). Growers who sell more than 500 trees per year will be required to pay 15 cents per tree to help fund a national marketing effort to promote real, farm-grown Christmas trees.

Your Investment of Time and Money

“They just grow, don’t they?” Christmas tree growers often hear this question from friends, neighbors, customers, and others who think that this line of “work” is just a matter of planting some seedlings and waiting for them to grow. This misconception leads people to picture Christmas tree farming as a low-investment, high-return proposition: Just buy a small seedling, stick it in the ground, and kick back a few years before selling the tree for a 300- or 500-percent return on investment.

Even the nurseries that sell Christmas tree seedlings and transplants are often not realistic about how much labor, time, and expense you will have to put forth before you get a stream of income. No matter what the catalogs imply, the cost of buying and planting the small trees will not be your last or, in most cases, even your biggest investment.

Budgeting Tips

Before you order the first tree, it is important to plan carefully an investment budget of both time and money. You will probably find that the time involved is harder to estimate than the money, because your hours will vary depending on your site, how much work can be done mechanically, the tree species you’re growing, the amount of labor you hire, disease and pest outbreaks, and other factors.

Don’t overlook office expenses as you make out your budget. Advertising, insurance, taxes, postage, telephone, stationery, bank fees, and association dues may seem minor, but can add up to a large figure over a period of years. There may also be legal expenses incurred to start up your business, apply for zoning variances and permits, and so on.

Size of Operation

The degree of investment required will depend on the size of the Christmas tree farm you are establishing. It is difficult to define precisely what qualifies as a small, medium, or large operation, but there are some general criteria.

A small planting is one you can manage with the tools and equipment that a gardener or small farmer would ordinarily have on hand. A small operation might be up to several acres in size, harvesting a few hundred trees per year. An operation of this size can be strictly a spare-time occupation, but you must devote a fair number of evenings and weekends throughout the year to planting, as well as to controlling weeds, insects, and disease, and a few weeks each summer for shearing.

A medium-sized operation, perhaps 10 to 50 acres, will probably require extra labor as well as more power equipment. On this size tree farm you will probably need a tree planter, mower, fertilizer spreader, sprayer, tractor, and tree-harvesting equipment. There will also be the annual expenses of fuel, storage of equipment and supplies, fertilizer, machinery upkeep, pesticides, and labor — all of which can add up to a sizable amount before the first tree is sold.

A large planting will occupy hundreds of acres, involving a great deal of equipment, labor, and investment that is beyond the scope of what is covered in this book.

Managing Costs

Before you buy new equipment, look online and in newspapers and trade magazines for classified ads offering used equipment, and check out auctions of growers who are discontinuing operations. Christmas tree associations often have “buy, sell, or trade” classified ads in their newsletters and/or websites.

As in most farm operations, careful attention to production and

harvesting costs, even the seemingly insignificant financial ones, can make the difference between success and failure.

Selecting the Best Site

If you are planning to buy land specifically to grow Christmas trees, you have the advantage of searching for the perfect location. Look for land that is accessible by a good road, with fertile soil suited for the species of trees you want to grow, in an area blessed with an ideal climate.

You may also be able to find property near the market you want to supply. In locations far from population centers, the price per tree may be only one-half to one-third of what it might be near affluent suburbs, where there are fewer trees growing locally and the cost of living is generally higher.

Drainage

Perhaps the most important consideration, though, is to find a well-drained site. Nurseries tout some species and varieties as “tolerating” wetter conditions, but the reality is that every tree does best on well-drained soils. If the soil remains wet for extended periods, the trees planted there are likely to fare poorly or, more likely, to die as their roots “drown” without access to oxygen. Tree-killing root rot diseases, such as *phytophthora* (water molds), also can spread in wet soils. If you have ground that is wet for long stretches of the year, consider the cost of installing drainage before planting, or else look for other land.

Out in the fields, adequate drainage is essential for reasons beyond tree growth. Good summer roads may turn to something like quicksand when they become muddy or snowy in early winter. The harvest season is so short that any transportation problems will be costly in time and money. For larger operations, where at least some trees will be sold wholesale, access to a roadside is important for trucking purposes.

Terrain

The lay of the land and steepness of a slope are also important considerations when you're looking for a plantation site. Most Christmas tree species can be grown successfully on slopes that don't suit other crops. Such locations may limit the use of machinery, however. That means that planting, mowing, fertilizing, and other care must be done by hand.

Late spring frosts can damage the early new growth of trees, so avoid planting in frost pockets, which are common in confined valleys or low areas (depressions) where frigid air can become trapped and settle. In colder climates, northern slopes that warm up slowly in the spring and thus delay early growth are ideal if they are not too steep, as are higher areas as frost is likely to be confined to lower valleys. If you don't have such a location, plant only trees that tend to bud-out later in the spring, after the danger of frost has largely passed (see information on specific tree types in chapter 2).

Cold air settles in low areas. Trees in these frost pockets are at increased danger of being damaged by late spring frosts.

Different parts of the country have different site considerations. In open areas of the Midwest, for example, choose a site that offers at least some protection from the wind. Constant blowing can deform trees and desiccate the needles. To prevent this you may need to plant a windbreak around the plantation. No matter what region you live in, avoid sites that are prone to flooding or have heavy clay soils.

To create a successful plantation, the selection of a good site must be made in tandem with your choice of suitable tree species. Many species grow well in a wide variety of soils and in different climates, but all do best when conditions are to their liking as far as soil type, moisture levels, climatic conditions, and so on.

Soil: Depth, Fertility, and pH

Many advertisements for seedlings state that Christmas trees are an ideal crop for poor, worn-out soil. This implies that they will thrive where other crops will not. Trees may grow on such sites; however, trees planted in locations lacking **humus** (partially decayed organic matter) and nutrients usually grow slowly and have poor color. For successful tree planting, look for fertile, deep soil or, lacking that, soil that can easily be improved.

Learn something about the former use of your land. If heavy applications of lime have been made over the years in order to grow clover or alfalfa, the soil may be too alkaline for pines and perhaps even fir species. In heavily grazed pastureland, dig down in several areas to assess the depth of soil and determine whether surface water could collect and drown tree roots during heavy rains or melting snows.

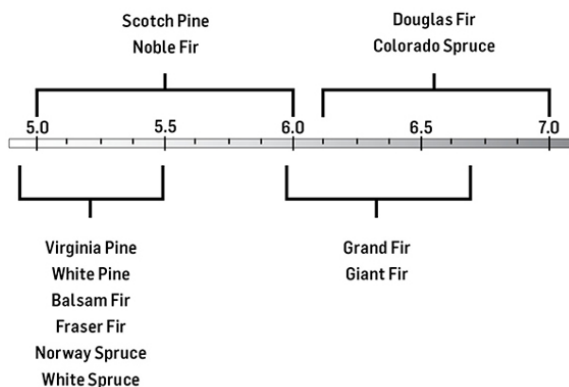
pH

Excessive amounts of sulfur and **peat**, combined with a lack of calcium, can make the soil overly acidic. Too much calcium, such as lime, can make it excessively alkaline. Either condition can lock up soil nutrients, making them unavailable during the growing season. Fortunately, most Christmas tree species grow well in a wide range of soils, as long as they contain sufficient amounts of humus and nutrients. However, each has a **pH** preference. Fraser fir likes a low pH, in the 5.0 to 5.5 range; balsam fir does best in soils below 5.5; Colorado spruce, 6 to 7; and most pine species prefer a more acidic soil, from 5 to 6.

Deciphering pH

Soil acidity/alkalinity is measured on a pH scale of 0 to 14, with 7 being neutral. Readings of less than 7 indicate acidic soil; more than 7, alkaline soil. Most soils fall between 4 and 7.

OPTIMAL PH SCALE FOR EVERGREENS



pH scale. Your soil may contain plenty of nutrients, but the roots will take them up only when the soil pH is within the preferred range of the tree species you are growing.

Reading the Land

The plants already growing on your land can be clues to soil acidity. Most promising is when the tree species you want to raise are already thriving naturally. Where clover and goldenrod grow lavishly, the top few inches of soil probably has a pH of 6.5 or higher. Abundant white cedars and “hard” water in nearby wells indicate a high pH at a

deeper level. Sorrel, laurel, and wild blueberries tell you that the topsoil is acidic. The presence of oaks, pines, and hemlocks growing naturally mean the subsoil too is acidic.

If you don't feel confident about deciphering the soil acidity by observing the plant life in the area, invest in a soil test kit, or collect soil samples and send them to a specialized testing lab, being sure to follow their instructions. Let the lab know exactly what crop you intend to grow, as it may determine the tests they run and the soil amendments they suggest.

Take a good look at the condition of the soil on the plot of land you will plant. Good soil contains a high amount of humus, which can absorb both moisture and nutrients and release them later as the tree needs them. Humus also serves as a valuable buffer. Soils well supplied with it are more forgiving of chemical excesses and more tolerant of elevated acidity or alkalinity. Soil in good condition needs little or no improvement before planting. It can produce crops of trees with good color and heavy needle density indefinitely, with only an occasional feeding.

Your county agent, forester, or soil conservation official can advise you, usually at no charge. This is a conversation worth having, as an expert can spot conditions that are not readily obvious and may also recommend specific soil tests or leaf and plant analyses.

Climate

If you already own the land where you plan to grow trees, you can't do much about climate. You should, however, be careful to match the seedlings you plant with your local conditions. Most firs and spruces need cool summers and long, cold winters to thrive, so they grow well only in the northern states, southern Canada, and the higher elevations of the Appalachians. The pines grow well over a much larger area and some species thrive in southern and southwestern regions (see chapter 2 for more detail on different species).

When searching for a good micro-climate for growing, look beyond the average highest and lowest temperature readings. Adequate rainfall is also very important for good tree growth, especially during the weeks in early summer when evergreens make their visible top growth, and as the roots continue to grow through the late summer and fall. This is when the trees take up the necessary nutrients and moisture that keep them green and fresh looking after harvest. Christmas trees are irrigated on some farms, but this is expensive and requires a good supply of water.

Current Residents

Wild animals such as deer, moose, elk, and even some of the smaller creatures such as porcupines can be menaces, so you should check on their density and figure out the best ways of coping with them before planting. If a fence will be necessary to keep pests out, it will add considerably to your costs, both to build and to maintain.

Enter the Trees

You don't need to be able to identify every evergreen species that grows across the country in order to grow good Christmas trees. To create a successful plantation, however, you should know the kinds best suited for your region.

Decisions on a site and species of trees to grow should be made in tandem, because whichever choice you make first, the second must be compatible with it. Depending on your location, you may have a wide choice of trees that will grow well and be salable, or you may be limited to only one species.

Selecting Species

Of the large number of evergreens that grow in the temperate zones of the world, only a few species are commonly used for Christmas trees. Others may be attractive in forest or landscape settings, but lack the qualities that Christmas tree customers want or growers find practical to raise. Pines, spruces, and firs supply most of the world's markets.

Among these major species, many different varieties are grown as Christmas trees; we have summarized some of the more popular ones here. Check with your local Extension office and state Christmas tree growers association to learn more about other niche varieties that may be grown successfully in your area.

If you are planning a small operation and selling only to local customers, you may want to plant several varieties of trees to give your customers a choice. Wholesale plantations, however, will want to grow only those species for which there is high demand and established markets. Find out what other growers in your region are raising, and whether they have unsold trees at the end of the season.

Unlike fruit trees, which are commonly propagated by grafts, cuttings, divisions, and sometimes tissue culture, Christmas trees are nearly always started from seed. A small number of superior trees are grown together in a spot isolated from other trees, where they will be pollinated only by one another. These special "seed orchards" produce seeds that the propagators expect will grow into high-quality trees resembling their parents. Much work goes into identifying and nurturing seed trees until they are mature enough to produce seed, and then into collecting the seed and growing seedlings. Unless you have the time and expertise to take on these propagation tasks, it is better simply to buy planting stock from a reputable nursery.

Nurseries now offer seedlings of these improved strains, and most Christmas tree growers are planting them instead of pulling small trees from the woods or planting seed from random native species, as was once done. Even though the new introductions offer superior appearance and growing characteristics by comparison with those

used in the past, plenty of work is still required to make them live up to their potential.

The Pines (*Pinus*)

Particularly in southern areas and across the Midwest, pines are popular with growers because they rapidly develop into salable trees. They grow well in a wide range of climates and in most soils, even though they prefer those that are somewhat acid. Pines are more drought-resistant than most other trees, because after they are three or four years old they develop deep-growing **taproots**.

The trees need heavy annual shearing, which must occur during the short period in early summer when they are making their new growth. While the exact timing will vary from place to place, a general rule of thumb is to shear pines when the length of the new needle growth reaches one-half to two-thirds the length of the prior year's needles, or when the top leader has nearly reached its maximum length and begins to harden. Because this job is time-consuming after the trees reach a few feet in height, be careful not to plant more pines than can be sheared properly in the required time.

The many shearings needed to force pines to grow into a compact shape also cause them to develop thick stems that are heavy to handle. Because cooler weather can make the needles of some pine species develop a yellow appearance, some growers choose to spray their pines with a green colorant just prior to sale in order to restore a more acceptable appearance.

Common insects impacting pines: Sawflies, shoot and tip moths, spittlebugs, webworms, weevils

Common diseases impacting pines: Needlecasts, Sclero-derris canker, rust, twig canker

Scotch Pine

(P. sylvestris)

Scotch pine was originally imported from Europe for the fast reforestation of timbered areas. It proved a disappointment as a timber and pulp producer, but Christmas tree growers have adopted the tree and, thanks to improved varieties on the market, it is one of the most popular species grown in many parts of the country.

Scotch pine requires heavy shearing, and it is susceptible to a variety of insects and diseases, including needlecast, gall cankers, tip moths, and sawflies.

Optimal pH: 5.0–6.0

Microclimate needs: Prefers average to somewhat dry conditions

Virginia Pine, Scrub Pine

(P. virginiana)

This species is widely grown in the southern states because it tolerates warmer temperatures even better than Scotch pine. Virginia pine also grows quickly and can produce a marketable Christmas tree in five years, while Scotch pine typically needs six to nine years. Because it is faster growing, however, Virginia pine typically needs to be sheared more often (more than once per summer) than these other species.

Optimal pH: 5.0–5.5

Microclimate needs: Can tolerate hot, dry conditions; prefers well-drained soils

White Pine

(P. strobes)

The white pine has been valued as a timber tree for centuries, and when sheared heavily it also makes an attractive Christmas tree. It is mostly grown in the mid-Atlantic states. Buyers admire its soft green color and woody fragrance but sometimes object to the long needles that give it a coarse appearance. Growers appreciate its fast growth habit and ability to do well in many different soils and climates, but don't always relish the heavy shearing it requires.

White pine tolerates moist soils better than do Scotch and red, but to grow well it needs a more fertile soil than do those species.

Optimal pH: 5.0–5.5

Microclimate needs: Performs best in moist but well-drained, acidic soils; susceptible to salty conditions and air pollution

The Firs (*Abies*)

Firs are grown as Christmas trees by the millions across the entire northern swath of the United States, as well as in eastern Canada and more mountainous areas in non-northern places like North Carolina. Their needles are flatter and softer in texture than those of the spruces, and their form is more naturally inclined toward a conical shape than with the pines. When the trees are young, they do not compete as well with weeds and grass as do the pines and spruces, making it more important to control surrounding vegetation. The cones stand upright and burst apart on the tree, rather than falling intact to the ground after opening in the way that pine and spruce cones do.

Fir trees are more shallow-rooted and less tolerant of drought than pines are, and they like the coolness of a north-facing slope. They seldom become wind-burned, but their early spring growth is sensitive to late frosts. Growers in areas prone to late-spring frosts should try to obtain varieties described by nurseries as **late-breaking**, meaning new growth delays breaking out of the protective bud until after the biggest frost danger has passed.

Common insects impacting firs: Balsam shootboring sawfly, budworms, Cooley spruce gall aphids, gypsy moths, mites, Pales weevils, spittlebugs, woolly aphids

Common diseases impacting firs: Cankers, Rhabdocline needlecast, Uredinopsis rust

Balsam Fir

(*Abies balsamea*)

To many Easterners, a balsam is the only true Christmas tree because it offers that fragrant scent so associated with the holiday. It is naturally cone-shaped, with rich green needles.

Balsam grows best on soils that are not too acidic, and it even does well on soils that are fairly moist, as long as adequate nitrogen is supplied via fertilization. Shearing is faster and easier than on the coarser-growing pines.

Optimal pH: 5.0–5.5

Microclimate needs: A cold-climate tree, does well only where winters are cold and summers cool

Canaan Fir

(Abies balsamea var. phanerolepis)

While balsam and Fraser have been the most commonly grown firs for many decades in the eastern United States, a number of growers have lately turned their attention to Canaan (pronounced “Ka-naan,” with emphasis on the last syllable) fir, which originated in the Canaan Valley of West Virginia.

While it can be difficult to distinguish Canaan from balsam, and it is even sometimes referred to as “bracketed balsam,” true Canaan fir has distinct traits. Because of this late budbreak, many growers report fewer problems with pests such as balsam twig aphid, which are active earlier in the spring. Once harvested, Canaan fir tends to be much lighter (in terms of weight) than other balsam, and certainly Fraser fir.

Optimal pH: 5.5–6.0

Microclimate needs: Prefers a cool climate and well-drained soils, but tolerates excess moisture better than balsam or Fraser. Tends to break bud very late, thus a good choice where late-spring frost is a concern

Douglas Fir

(Pseudotsuga Menziesii, formerly P. taxifolia)

As the scientific name shows, the Douglas fir is not a true fir, but it does resemble the *Abies* genus in appearance with one exception: its large cones hang downward rather than stand upright as do those of the firs. In many parts of the U.S. Northwest, in British Columbia, and in the foothills of the Rocky Mountains, it is the most widely grown Christmas tree. Growers in some other parts of the country have ceased planting Douglas fir, however, because of problems with needlecast diseases. The tree grows naturally cone-shaped, has a rich green to blue-green color, boasts excellent needle retention, and can be sheared to a beautiful tight form.

Douglas fir strains vary considerably. Growers should investigate sources and buy only proven seedlings from reliable nurseries.

Optimal pH: 6.0–7.0

Microclimate needs: Has a low frost tolerance; does not compete well with grass and weeds

Fraser Fir

(*A. Fraseri*)

Most of what has been said of the balsam fir is also true of the Fraser. In fact, botanists don't agree whether the latter is a distinct species or a climatic variation of the balsam. The Fraser's branches, though, tend to grow at a slightly more upward angle, and Fraser needles are usually a bit shorter, have a dramatic silvery-white flourish on the bottom, and feature a more dense growth habit than those of balsam. Fraser is renowned for its superior needle retention after harvest.

Fraser breaks bud later and is thus more frost resistant than balsam. It is also more susceptible to some insect and disease problems, especially aphids, spider mites, budworms, and diplodia tip blight. It also typically requires more nutrient inputs.

Optimal pH: 5.0–5.5

Microclimate needs: Less tolerant of wet soils than balsam, but doesn't do well on extremely dry land either; grows best on cool northern sites in zones 2 to 4, and grows naturally at elevations above 5,000 feet in the Appalachians

Grand Fir, Giant Fir

(*A. grandis*)

This tall-growing western fir is grown as a Christmas tree mostly in the inland states of the Northwest (Idaho and Montana), where winters are not too long or severe. It can be identified by its two distinct rows of needles, with glossy green tops and bottoms that feature two distinct white lines.

Optimal pH: 6.0–6.5

Microclimate needs: Requires a cool, moist climate; grows very rapidly where conditions are right

Noble Fir

(A. procera)

This attractive tree grows naturally in only a small area in the Pacific Northwest. Plantings in other parts of the country have not often been successful. Its stiff branches are perfect for ornaments and the upward orientation of the needles offers a dramatic appearance. The noble fir is also known for long needle retention after harvest.

Optimal pH: 5.0–6.0

Microclimate needs: For good growth, needs a short growing season and high humidity, but little summer rain; best at altitudes between 1,500 and 4,000 feet

The Spruces (Picea)

With their stiff, square needles and rough bark, spruce trees are prickly to handle. As a rule, they do not hold their needles for long periods after harvest unless they are kept cold, so spruces should be cut as near Christmas day as possible.

Common insects impacting spruce: Budworms, Cooley spruce gall aphids, gypsy moths, mites, Pales weevils, spittlebugs, woolly aphids

Common diseases impacting spruce: Cankers, Rhabdo-cline needlecast, Uredinopsis rust

Colorado Spruce

(P. pungens)

This tree is familiar to most people as a landscape plant, especially in its striking blue form. Although native to only a small area of the Rocky Mountains, the Colorado spruce has adapted to a wide range of soils and to most of the northern part of the United States and Lower Canada.

In its favor are good form, good response to light shearing, and rapid growth after it reaches 3 feet in height. Since it breaks bud later than most conifers, it is seldom damaged by late frosts. It is even more prickly and more difficult to wrap than the white spruce, however, and thorny to decorate.

Seedlings and transplants that have the best blue color are scarce and expensive, because only a small percentage of the seed, even from a good blue tree, will actually be blue; most will be various shades of green or blue-green.

Optimal pH: 6.0–7.0

Microclimate needs: Shows better color when sheltered from the wind and given additional nitrogen at the beginning of the growing season

Norway Spruce

(P. abies)

This hardy, fast-growing tree does well in a variety of soils and climates and is grown as a Christmas tree in some areas of the Northeast. The tree needs heavy annual shearing to produce a dense, tightly shaped tree, and in some areas its short needles and dark, somber color don't appeal to customers.

Optimal pH: 5.0–5.5

Microclimate needs: Can tolerate windy conditions

White Spruce

(P. glauca)

One of the hardiest evergreens, the white spruce needs a cold climate to survive and grows naturally and at its best in eastern Canada and the northeastern United States. It competes well with weeds so is good for growing in sod. Other pluses: it has an attractive blue-green color and nice cone shape and needs very little shearing. But it has poor needle retention and a strong odor in a warm room, making it more popular for outdoor than indoor decorations.

Optimal pH: 5.0–5.5

Microclimate needs: Thrives on a wide variety of soils, but grows more slowly when the soil is acid or wet

Other Species

Many other evergreens are used on a limited scale throughout the country, either because of local preferences or because the most commonly grown species in other parts of the country don't grow well locally. Afghan pine (*Pinus eldarica*) is grown in Arizona and New Mexico. Eastern white cedar or arborvitae (*Thuja occidentalis*), red cedar (*Juniperus virginiana*), and cypress (*Cupressus*) all enjoy local popularity where they grow well, but all need to be cut early before they turn brown for winter.

Exotics

A relatively recent trend has growers experimenting with “exotics” — species native to other parts of the world that offer an alternative to the trees traditionally grown and harvested in the United States and Canada. Some examples:

- **Corkbark fir.** (*Abies lasiocarpa*) Extremely cold-hardy. Distinctive blue-green appearance
- **Korean fir.** (*Abies koreana*) Has a very beautiful and showy white underside to its branches
- **Nordmann fir.** (*Abies nordmanniana*) From the Georgia/Russia border. Cold-tolerant and resistant to twig aphid and spider mites
- **Turkish fir.** (*Abies bornmuelleriana*) Can handle cold climates
- **Veitch fir.** (*Abies veitchii*) Native to Japan. Can tolerate both cold weather and low-pH soils
- **Meyer spruce.** (*Picea meyeri*) Native to China. Blue-green. Excellent needle retention, a characteristic not usually associated with spruce

In some cases, these exotics have unusual growing habits, which require trial and error to learn to manage. For that reason, some are being crossed genetically with more traditional Christmas tree species (for example Korean fir X balsam), which can combine some of the best traits of each.

Typically, growers initially incorporate these exotic species into their farms in smaller numbers to gauge how the trees handle local climates, soils, and other conditions. There also can be a learning curve about how to fertilize, shear, and otherwise manage these exotics. But the prospect of finding a new tree that may not be susceptible to the usual diseases and insects common in a given area, along with the promise of a unique or distinctive appearance that might appeal to customers, continues to drive experimentation with exotics. The Exotic Conifer Association (www.exoticconifer.com), a national organization, has been formed to promote the exchange of knowledge about exotics being grown as Christmas trees.

Wholesale growers may want to stick more with the established species for which there is a known market, but smaller growers selling locally shouldn't be afraid to experiment with some less commonly grown trees. There are always customers who are looking for the unusual, and supplying them can be good publicity for your business, as well as fun for you.

Planting and Growing

In years past, many Christmas tree growers simply pulled their planting stock out of nearby woods. However, this wild stock often lacks the characteristics — fast growth, late budbreak to avoid frost, dark color, etc. — now offered by improved varieties. Buying high-quality seedlings or transplants from a reputable nursery will greatly enhance your chances of producing high-quality Christmas trees in as short a rotation time as possible.

Nursery Stock 101

Christmas tree nurseries raise their planting stock by sowing specially selected seed in carefully prepared beds. After two or three years, when the seedlings are well established, they are dug and either sold as seedlings or transplanted to new beds where they grow for an additional one or two years before being sold as transplants.

As you read a nursery catalog or price list you will notice that planting stock is listed as (2-0), (3-0), (2-2), and so on. The first number refers to the number of years in the seedbed and the second to the years spent in a transplant bed. For instance, “Balsam fir (2-0)” means they are two-year-old seedlings, while “Balsam fir (2-2)” trees are four years old, having spent two years in the seedlings bed, and two more in the transplant bed.

Seedlings typically cost a little less than larger transplants, but they perform well when planted in bare earth settings with no weed competition.

Some trees are grown as “plugs” (also sometimes called **tubelings**). These are grown in plastic trays with individual cavities that are narrow in diameter, but several inches in length so there is ample space for root growth. They are usually started in a greenhouse and carefully nurtured so that after only one growing season they are often as large and heavily rooted as a small transplant grown outdoors. Container-grown plants become established quickly because the root mass is intact and undamaged by digging.

Seedlings have the advantage of being low in price, but their root systems are often small. This means it may take a year or more before they get well enough established to start growing after they are planted directly in the field. Pines can be an exception, however, and a sizeable three-year-old seedling is often husky enough for field planting.

Tubelings make for quick planting and, though often smaller than seedlings, fare well because their root systems are left intact.

Firs and spruces typically fare best when they are field-planted as transplants. The additional year or two of growing time and extra room to grow in the transplant bed allow them to develop a much larger root system, which better equips them to survive field planting and get off to a fast start.

There can be too much of a good thing, though. You may be tempted to buy the largest planting stock available, in order to shorten the time required to produce a salable Christmas tree. Especially large transplants, however, or those older than 3-2 (3 years of growth in a seed bed, 2 years as a transplant), do present some challenges. They can be more difficult to plant (requiring a larger hole and more labor time). They may also experience more “transplant shock” in the first year after planting, because a larger portion of their roots likely had to be removed when the plant was dug by the nursery or planted by the grower.

Transplants are typically larger than seedlings and have a more extensive root system.

Wherever and however you buy your planting stock, place your order early to improve the chances of getting the species, strains, and sizes you want. Talk with other growers in your area to see which nurseries they patronize. When you order, specify the time you want them shipped, so you can be ready to plant as soon as they arrive.

Other Methods

Rather than purchasing transplants from nurseries, a few growers save money by buying seedlings and planting them for an additional year or two in a transplant bed (basically a garden setting). Here the plants

can develop a much sturdier root system and be better able to stand the shock of growing in the less favorable environment of the field.

Finally, some growers still choose to harvest their own planting stock from nature rather than purchasing from a nursery. It is possible to pull young, native seedlings or even larger transplants directly from the woods, and certainly this is one way to lower planting costs. But keep in mind that those native trees may not offer the same characteristics that some improved varieties available from commercial nurseries may provide.

Choosing a Growing Method

There is no absolutely right or wrong way to grow trees, but the approach you choose will determine how best to set up your farm. Planning ahead about what cultural practices you will follow can help prevent a lot of wasted effort and cost in terms of readjusting your farm in the future.

For example, 10 different Christmas tree farms will most likely exhibit a wide variety of planting, shearing, and weed-control methods, and each one might appear to be producing good trees. If you visit each and observe them closely, you may see that while each has its merits, each also has some negative facets that you should understand before making a decision about how you want to approach Christmas tree farming.

The first step is to determine how you will grow trees.

The Sod Method

Keeping the land entirely in **sod** (grass cover) was the method used almost exclusively in the early days of Christmas tree culture. It is still the favorite of many growers, who view it as a natural method. In nature, however, trees typically grow in forests rather than in open fields, where they must compete with grasses, weeds, and other plants for water and nutrients. Planting a small tree, even a well-developed transplant, into sod places the tree at a disadvantage.

Advantages

- Grass-covered soil is better protected from erosion than bare soil. Bare soil loses organic matter quickly when exposed to the sun and wind; it loses further nutrients and topsoil when washed by heavy rains or snowmelt.
- When the grass dies down each winter, it adds humus and

nutrients to the soil, gradually improving it. This buffering action also helps avoid some of the problems caused by excessive use of chemical fertilizers and pesticides.

- Grass sod keeps tree roots cool in summer and protects them from extreme cold in winter.
- Because sod absorbs moisture, rain soaks into the soil rather than running off as it could on bare earth.
- A covering of grass also helps to minimize the soil compaction caused by walking or driving equipment over the ground.
- Sod encourages earthworm activity, which helps keep the soil loose, thus allowing tree roots to grow more easily.

Disadvantages

- Weeds growing unchecked will compete with the trees for moisture and nutrients.
- High grass and weeds can deform the lower branches of the trees by crowding and shading them.
- Vegetation can hide rocks and stumps that could damage mowers and other machinery.
- Tall grass makes it more difficult to shear, fertilize, and otherwise manage the trees, slowing workers' progress in the plantation and making it difficult to spot hazards such as hornet nests, gopher holes, and the like.

The Bare Earth Method

At the opposite end of the spectrum is a method in which growers keep the land completely bare of everything except the trees. As with other bare-ground crops, this requires herbicides or (if the plantation is small) cultivation.

Advantages

- Both the applied nutrients and those that already exist in the soil are available to the tree, without competition from any ground cover.
- Tree roots face no competition for moisture from other plants.
- The environment is easy to work in.
- Good air circulation through the trees can alleviate some disease pressure.

Disadvantages

- When topsoil lies naked to the elements there is an increased potential for erosion, causing a rapid loss of nutrients and also of valuable organic matter.
- Without humus, light soils dry out quickly. Those with clay turn to deep mud in wet weather and bake hard in dry seasons, making good root growth impossible.
- If your planting is on a slope and the soil is of the type that will wash badly during hard rains, you will lose valuable topsoil and can also end up with deep ditches that are difficult to repair.

Combination Methods

Many growers use a combination of these two practices, opting for the advantages of a sod cover while actively working to minimize competing growth directly around each tree. Small plantations can be mowed regularly. String trimmers can be used to keep grass down around each tree. Since this is expensive and time-consuming, most growers mow only once a month or even just two or three times during the summer and rely on herbicides around the tree.

Grass is allowed to grow over most of the field, but before planting, a strip where the trees will be set is treated with pre-emergent herbicide, which will control vegetation the following spring. Some growers choose to till the row strips. Once trees have been established, many growers use an herbicide to maintain either a weed-free circle around each tree or the narrow strip along each row

of trees. The sod row in the middle between the trees is usually mowed at least once during the season.

How Conifers Reproduce

The goal of Christmas tree growers is to sell their trees *before* they begin to produce cones, which require extra time and labor for removal. Nevertheless, it's useful to understand how conifers' reproductive cycle differs from that of the more familiar deciduous trees.

Conifers have male (pollen) cones and female (seed) cones, and they are wind-pollinated. Male cones (A) are small, inconspicuous, often on lower branches, and similar across species, and they release pollen to drift on the wind to female cones. Female cones (B) are larger, woody, higher in the tree, and distinctive according to species, and they produce their seeds between the scales on the cones.

As the female cone matures the scales open to release the winged seeds on the wind (C). With many species, the cone opens in dry weather, when it's best to disperse the seeds, and closes in damp weather.

Preparing the Soil and Planting

If you have a lush, fertile field to start with, you might not need to tackle any soil improvement before planting — and you can count yourself very lucky. The condition of most soils is not that good, though, and usually some sort of initial treatment is necessary for best growth. As with most growing practices, there are many different ways to improve your soil and you will have to decide what is best for you.

Testing and Amending the Soil

The first and most critical step is to test the soil. Follow the soil-testing procedures of whatever state or private testing lab you use regarding when and how to sample.

If you are using the bare ground method, first test your soil, then amend it prior to planting by tilling and fertilizing the plot, adding lime if necessary. This method offers faster results because some nutrients, such as phosphorus, are mostly immobile in the soil and are much more available to the tree when they have been incorporated rather than applied on the surface.

If you grow your trees in sod you can also test the soil, then surface-apply whatever nutrients and lime have been recommended from the test results. Some growers prefer to treat the entire area, while others will treat only the rows where trees will be grown.

If you are treating a large acreage you will likely need a tractor-mounted spreader. Regardless of the method used, it is important to calibrate the spreader to guarantee consistent and uniform coverage of lime or fertilizer. Follow the spreader manufacturer's guidelines for calibration; if you purchase a second-hand spreader or have lost the owner's manual, use the make/model to check online — there's often a free PDF available on the Internet.

Planting

Spring is the best time to plant tree seedlings because they then have an entire growing season to become established before facing the ravages of winter. It is better to set out transplants in spring, too, because the ground is more likely to be moist then, but late summer planting is feasible if the weather is not too dry. The larger root system of transplants enables them to become well established before the ground freezes and they can then get off to a quick start in the spring.

Speed is important in planting. Trees should come from the nursery wrapped in packages of around 50 or 100, depending on the size of the transplants ordered. Those packages should be stored in a cool, dark place until the trees are ready to be planted. Spraying water on/through them occasionally with a hose can also ensure they stay moist.

Once each package is unwrapped, never leave the roots exposed to air or sun for more than a short time or they will dry out and die. Even a few minutes of exposure on a hot, windy day can dry out the roots. Keep the pile of unplanted trees thoroughly soaked and covered, and carry only a limited number at a time in a pail of water while planting in the field. The longer the root systems of seedlings or transplants are exposed to the elements (air, wind, sun), the likelier it is that the planting will be ultimately be unsuccessful. Rewetting roots that have been drying for hours in the sun may make them look moist again, but the chances of the root-dried tree surviving once it has been planted are poor.

Tree Spacing

You don't want to waste land by planting too sparsely, but remember that the trees that you are planting will quickly grow larger and, if planted too close together, create an overcrowded field. Such tightly packed fields make it difficult to work (shear, mow, etc.) and may damage the quality of the trees themselves by preventing air circulation (leading to increased risk of disease) and limiting access to

sunlight (stunting growth or deforming branches).

Plant trees that will be cut when they are 5 to 7 feet tall *at least* 5 feet apart in both directions. Those that you will harvest at larger sizes need more room. If you plan to use a power mower to control weed growth, allow a wide enough space between the rows to accommodate it, even after the trees have increased in size. A common practice when equipment will be used between rows to mow or spray is to make the spacing of tree rows a little wider than the space between trees within the row: a 6 × 5-foot spacing, for example.

The chart shown here provides examples of how many trees can be planted per acre at different spacings.

Number of Trees per Acre at Different Spacings

Spacing indicates distance between trees both within rows and between rows

These figures of trees-per-acre don't take into account roadways left open in the field. Unless your operation is very small and you do everything by hand, you'll want to leave plenty of space for roads throughout your plantation. This eliminates the need to drag cut trees long distances at harvest time or carry fertilizer very far to the growing trees. In a large plantation, ideally there should be a road every 15 to 20 rows of trees. Omitting two or three rows of trees makes a road of adequate width, unless your equipment is very large.

Planting Strings

Planting strings or wires are a big help when first planting in an open field. Commercial planting strings are available with distances marked along the string at various intervals, or you can make your own. The string is stretched along a row and a tree planted at each mark. If the first trees in each row are planted in a straight line, all the trees will be in straight rows up and down, back and forth, and diagonally. This type of planting not only looks nice, but also makes it possible to mow

between the trees in several different directions, if desired. Having a measuring stick at the end of each row makes it easy to move the string from one row to the next and keep the spacing between rows uniform at the desired distance.

A simple planting string can ensure straight rows and even spacing in a plantation, making for a neat appearance and more efficient management in coming years.

Planting Machines

If your operation requires setting out thousands of trees annually, a tree planter may be practical. There are many models of tree-planting machines that attach to tractors, and all basically work in the same fashion. A cutting wheel opens a slit in the ground, into which the operator sitting on the planting machine places a tree before trailing wheels close the slit back up. Depending on soil conditions and the size of planter used (one-person, two-person, etc.), a three- or four-person crew can plant up to 10,000 trees a day with these machines.

A tree planter cuts a slit in the ground and then closes the soil back up once a transplant has been inserted. In open fields that are mostly free of rocks, it is a very efficient method of planting.

A planting machine is fast and sets the trees evenly spaced in straight rows, but it must be properly adjusted and operated by skilled workers. It should open a slit in the soil large enough so all the roots of the tree can be speedily inserted, and then press the soil firmly around the roots to prevent any air pockets that would dry them out. Since this procedure is so critical to the survival of the trees, many growers walk behind the planter to ensure that each tree is upright and well anchored, and to firmly step-down the soil around each one.

Hand Planting

Hand planting is necessary (or preferred) in many situations: on rough, stony pastures; on steep hillsides; for replacing trees within existing rows that have died or been harvested.

1.

Drive the planting implement straight down into the earth and move it back and forth to open a wide slit. Do not dig at a slant, because the tree roots will stay close to the soil's surface where they can dry out quickly. Make the hole large and deep enough so all the roots will fit in completely and not turn upward at the bottom (known as "J-rooting").

2.

Set the tree at about the same depth it grew in the transplant bed (look for a soil line on the stem) and high enough that none of the small lower branches are buried. Once the tree is in the ground, insert the spade a few inches away and push it toward the tree to close the hole completely. Repeat on the opposite side.

Interplanting

A common practice in many plantations is to plant a new transplant between two larger trees that will be cut in a few years. This interplanting means the land will not be wasted during the several years when only one tree would otherwise be growing, and shortens the time before the next harvest. The two or three years will allow the young tree to grow big enough to be seen and therefore not be damaged when the mature trees beside it are cut.

A good-sized transplant (2-2 size at least) is best for interplanting, because it needs to be rugged enough to fend for itself among the larger trees. To give the transplant a better chance of thriving, get rid

of weed and grass competition. One way of doing this effectively is to spray glyphosate (sold as Roundup and other brands) on the spot during the autumn before planting.

When interplanting, always provide adequate fertilizer to the new trees to compensate for the nitrogen that is already being depleted from the soil, first by the competing larger trees, and after harvest, by their decomposing roots. Additional weed control is usually also necessary, because weeds will grow faster thanks to the extra fertilizer and additional sunlight that they will get after the larger trees have been cut.

Managing for Efficient Production

Christmas trees are quite unlike most other crops, which are harvested the same year they are planted. After you plant Christmas tree seedlings, however, you have to wait 6 to 12 years, and after a harvest, you must plant again and wait for the next crop. (With fruit or nut trees, it will be nearly a decade before your first big crop, but at least that harvest is not your only one.)

Since the time from planting to harvest is so long, Christmas tree growers have developed various ways to shorten the growing period and produce annual harvests of a predictable number of trees. By raising faster-growing species, installing new transplants between larger trees a few years before they will be harvested, using better weed control, and fertilizing more scientifically, you can shave several years off the length of time necessary to grow a crop.

Maintaining Soil Fertility

Just as good nutrition and a wholesome environment produce healthy people, soil fertility is the key to healthy plants. Trees that are well nourished not only grow faster, but they also have better color, more resistance to disease and insects, and the ability to cope more successfully with drought, cold, and other weather extremes.

*A good **method of fertilizing** is to spread fertilizer completely around*

*the tree, just outside the perimeter of the branch spread, in early
spring.*

Tips for Success

Many growers use a gasoline-powered, handheld auger (post-hole digger) to speed up the hand-planting process. This tool does an effective job of loosening the soil and makes it easy to insert the tree speedily before you pack the displaced soil back around the roots.

Sometimes the roots of small trees are long and stringy, which makes it difficult to plant them rapidly. Cut a few inches off the bottom of the roots to speed planting up considerably. Don't worry about hurting the tree: root pruning also stimulates it to start growing faster. One rule of thumb is to try to leave as much root below ground as there is tree height above ground.

Depending on conditions (roots, rocks, field grasses, etc.), one person hand-planting alone can plant several hundred trees a day; two working together might do three times as many.

Planting near the stumps of trees that have previously been harvested, or near the edge of a forest, can present challenges due to existing roots in the ground. A spade or auger will easily work through smaller roots, but larger ones might require extra work to remove. Planting a foot or two away from stumps can help to minimize this problem.

Aftercare: The First Years

The first year after planting is the most crucial in the life of a new tree. If conditions are favorable, a transplant can become well established. During a dry season, however, the small plant may have difficulty fending for itself. Even if a tree survives this kind of stress, it will be especially vulnerable to insects and disease later. Although not always practical, watering or irrigating your trees for the first few weeks after planting can make a big difference in a dry spring when nature declines to do its part.

Even under ideal conditions, newly transplanted trees often exhibit little growth during their first year in the field. According to an old saying, when replanted, trees follow a three-year pattern: sleep, creep, leap. The saying suggests that it is not until the third season after planting that trees really begin to take off.

Assessing Fertility

If your soil was in prime condition at planting time, little maintenance will be necessary, because trees don't deplete soils as do crops like corn or potatoes. Like all plants, however, they require certain nutrients and these must be available in a form that the trees can absorb readily.

In addition to oxygen and moisture, trees need nitrogen, phosphorus, potassium, calcium, and magnesium, all familiar to farmers and gardeners who buy fertilizer. Necessary also, but in much smaller amounts, are trace elements, including boron, chlorine, cobalt, copper, iron, manganese, molybdenum, silicon, sodium, sulfur, vanadium, and zinc.

In much of North America, wherever soil is in good condition, enough of each of these trace elements is available to supply the minute amounts needed by Christmas trees. Some regions, however, have soils with one or more of them lacking. Boron, zinc, and manganese, particularly, are often in short supply and must be

supplemented. Your local or state Extension office should be able to warn you about common deficiencies in your area and may recommend a laboratory analysis of your trees' foliage.

Fertilizer Types

The fertilizers most commonly used by Christmas tree growers are granular types. Since trees need nitrogen especially, most growers prefer the ones with high nitrogen formulas, such as 10-5-5 or 15-10-10, rather than the 5-10-10 types used by gardeners. (The numbers refer to the percentages of the most needed nutrients — nitrogen, the first number, phosphorus the second, and potassium the third. The remaining percentage is an inert filler.) If a soil test indicates a need for magnesium or some other trace element, a fertilizer that includes it, represented by a fourth number (for example, 10-5-5-2), may be used. Fertilizer companies will supply formulas specially mixed according to whatever an analysis shows that the soil requires. This saves growers the expense of buying and applying nutrients that their soil doesn't need.

Organic fertilizers can also be used on Christmas trees. They release nutrients slowly and are less apt to “burn” the tree, but this fertility is also more likely to be absorbed by the sod cover. Also, nitrogen, the element most needed for good tree growth and the one lacking in most soils, tends to be more expensive when spread in the form of manure, cottonseed, soybean, blood meal, or other natural sources. (For more on organic farming, see [here](#).)

Fertilizing Methods

Fertilization is best accomplished in the early spring, before growth begins. Instead of simply dumping a small amount of fertilizer in one spot directly beside each tree, place the fertilizer just outside the spread of the branches (also known as the **dripline**). This will prompt the roots to reach out to it, creating greater root growth. Placing the nutrients close to the trunk encourages shallow rooting, with the

unhappy result that the tree is less able to locate the trace elements it needs or find moisture during dry spells.

You can carry fertilizers in a pail and apply them by hand, or use a back-carried spreader that releases a measured amount of the plant food through a tube, applying just the right amount to each tree with far greater ease. Larger growers favor tractor-mounted spreaders, some of which can be set up to apply fertilizer mainly in the tree rows rather than uniformly; this is desirable in plantations where sod is maintained between the rows.

With fertilizer, as with chemicals, more is not better. In an effort to get the fastest growth from their trees, many growers overfeed them. Using excessive amounts of chemical fertilizers wastes money and is likely to “burn” the trees by drawing water away from the roots. This will show up as a browning of the needles and can be extreme enough to kill the tree. Make sure, too, that the fertilizer is applied directly to the ground and not on the branches of the tree, where it can burn the foliage by direct contact. Applying excessive fertilizer can also lead to runoff, which can enter nearby water systems where the nutrients can create environmental problems. Some states and regions have recently enacted regulations about the types of fertilizers that can be sold (phosphorus is being eliminated in many fertilizers, for example), and instituted licensing/certification requirements for those who apply fertilizers in a non-residential environment.

Good color and steady (rather than excessively fast) tree growth should be the goals of your feeding program. For one thing, trees that grow too fast need additional shearing to keep them bushy. In addition, top **sprouts** that grow abnormally fast are weak and easily broken off in high winds or even by resting birds. Fast-growing trees are also more subject to disease and to aphid and other insect attacks. Finally, overfeeding, like undernourishment, may result in winter injury and other forms of stress from extremes in weather.

Adjusting Soil pH

If you have tested your soil and applied the correct amount of lime for the species of trees you are raising, it is unlikely that you will need to add more during the life of the crop. Exceptions could include very light soils where the calcium **leaches** out rapidly or those rich in aluminum.

If you are raising pine trees, only soils with a pH of 5.0 or less are likely to need lime. Firs and spruce prefer less acidity and are more likely to benefit from lime, but test your soil first to be sure of the need. Too much lime has the same effect as too little — it locks up the soil nutrients so trees cannot utilize them. Depending on the type of lime used, 100 pounds of lime spread over 1,000 square feet will raise the pH there one point. There are several forms, some of which are easier to spread.

Unlike fertilizer, lime can be added at any time of the year, but it is better not to apply it at the same time as chemical fertilizer. Sometimes an interaction between lime and certain types of fertilizer makes the latter less effective. Allow at least one good rain between the applications, if possible.

Soils in North America are seldom too alkaline, but if they have been heavily limed in recent years, you can restore acidity by spreading sulfur. Depending on soil composition, it may take up to 1,000 pounds or more per acre of sulfur to lower the pH just 1 point. Some sources, however, caution not to apply more than 300–350 pounds per acre per year to avoid damaging any trees growing there. Mixing peat moss into the soil will also make the soil more acidic, as will using a fertilizer with an acidic base, such as ammonium sulfate, rather than the more commonly used ammonium nitrate.

Weed Control

In the past Christmas trees were raised on farms. Growers solved their grass and weed problems by simply letting their cows and horses pasture in their plantings. It is tricky, however, to allow just the right amount of grazing to control weeds and hardwood brush, yet not damage the trees, so growers today have turned to other methods of controlling competing vegetation.

When trees are grown in sod, a combination of mowing and strategically applied herbicides are the usual methods of suppressing grass, weeds, and woody deciduous brush.

Herbicides

Many herbicides have been registered (approved) for use in Christmas tree plantations. It is not possible to explore each individual chemical in this book because the use of each is dependent on the species of tree being grown, the type of weed being controlled, and federal, state, and local regulations.

Let's emphasize here that herbicides vary greatly as to what they accomplish. Pre-emergent herbicides work in advance to retard weed growth, while post-emergent products kill plants that are already growing. Study the information supplied by your Extension service and product manufacturers to help you decide which ones best fit your needs. Some injure foliage, so the spray must be directed away from the tree's needles. Others are not safe to use on evergreens during the growing season, but can be safely applied in late summer or early fall after new growth has hardened. Also, pines, firs, and spruces all vary in their susceptibility to damage from various herbicides.

Don't be surprised if the results from spraying vary considerably each time, even when you carefully follow the directions. The effectiveness of some chemicals depends on the type of soil, the time of year, the air temperature, subsequent rainfall, the kinds of weeds

and their growth stage, and other factors. By keeping records, you will become more knowledgeable about the best way to use herbicides and get consistently good results from them.

One important note: Some chemicals are “restricted use” products. They can be used only by those people who have been licensed or certified in each state where they are being applied. This typically requires passing a test to show that the user understands how to properly read chemical labels, calibrate spray equipment, and follow other best practices as far as storing, handling and applying these chemicals. Most states offer training opportunities and study guides for people seeking to become licensed. Contact your local Extension office for guidance.

An Organic Approach

Fewer than 1 percent of Christmas tree growers are estimated to follow the standards for being certified organic. Start by talking to nurseries and local Extension professionals about varieties that will grow well in your area that and offer the best natural resistance to disease and insect problems. A true organic approach might involve finding a supply of these trees growing in the woods, where small seedlings can be pulled and transplanted on the farm, rather than buying planting stock from a nursery where chemicals are most likely used in seedling and transplant beds.

It certainly is possible to grow Christmas trees organically, especially on a smaller scale. Organic horticultural oils and insecticidal soaps can be used to control some insect outbreaks. Again, check with local Extension agents for guidance.

Growers with only a few hundred trees can devote the time to apply mulch, weed barrier fabric, or some other material to suppress weeds around young trees, and then perform extra mowings and string trimmings to keep grass and weeds under control once trees get larger. It is also possible to plant a low-growing cover crop, such as clover, to help prevent the growth of taller weeds that will choke out young trees. Organic weed control products, including vinegar-based sprays and flame torches (be careful not to incinerate your trees!) can also be used. Some growers even use livestock, such as sheep, among their taller trees to eat competing weeds and grasses, though be sure that there's other, more appetizing vegetation available so that the animals don't eat the trees.

One area where today's organic growers have a distinct advantage over previous attempts is fertilization. In addition to farm-generated materials like compost and manure, a wide array of commercially produced organic fertilizers are now available. These fertilizers can give growers greater control over the precise nutrients they want to apply, by comparison with farm-generated materials.

Most other Christmas tree growing practices — planting, shearing,

harvesting, etc. — are the same whether one is growing trees organically or not. With more and more emphasis placed on “going green,” there may be financial advantages in being able to market your trees as organic, including the ability to sell your trees at higher prices in order to reflect the additional hand work that has gone into their production.

Shearing and Pruning

In natural settings, trees are in a battle for sunlight, and thus are naturally more likely to grow tall and gangly than to develop the dense, well-proportioned form that high-quality Christmas trees exhibit. Shearing Christmas trees helps to promote that density, and this important practice has become much more involved in recent decades. Today, shearing is both an art and a science.

The terms “pruning” and “shearing” are often used interchangeably. Professionally speaking, **pruning** means cutting off woody portions of a tree, and **shearing** means cutting back soft new **foliar** (leaf or needle) growth. Therefore, cutting off the lower branches is considered pruning (read more about **basal pruning**). Clipping away the soft new needles to create the trademark conical shape of a Christmas tree, as in trimming a hedge or topiary shrub, is regarded as shearing.

Shearing

Do not underestimate the investment of time and labor that shearing will require. It is perhaps the most time-intensive and critical task related to growing Christmas trees. It's also one that will have a huge impact on the quality of the crop when sold. Miss even a single year of shearing, or do it incorrectly, and the grade of the trees produced will be greatly diminished.

Tools for the Task

Different tools are used for the two cutting jobs.

Pruning Tools

The most widely used pruning tools are the following: hand pruners, used for both light pruning and early shaping of small trees; long-handled loppers, used for heavier cuts; pole pruners (small pruners at the top end of a long aluminum pole), good for pruning or shearing tall trees; and saws, both hand- and power-operated, used for cutting off limbs that are too big for hand pruners to handle. Specialized motorized basal pruning equipment is also available. These devices resemble a landscape string trimmer or edger, but use vertically mounted carbide-tipped blades (similar to a circular saw) at the end of the shaft. Some growers have also found success basal pruning with battery-operated reciprocating saws.

Shearing Tools

The shearing knife is probably the most popular hand-shearing tool for Christmas tree growers because it does a fast, efficient job and is easy to sharpen. It must be kept very sharp to work well, so it is wise to wear leg guards and heavy gloves both when shearing with it and when sharpening it. Each downward swing of the knife should follow the angle desired on the tree; some experts teach that the shearing swing should be made from left to right across the body, while others prefer a right-to-left swing. Care must be taken in either case to avoid injury.

Some growers use manual hedge pruners (bottom-side up) to shear trees a few branches at a time, producing a shape that can look more natural and less uniform. This is the equivalent of cutting hair with scissors. On the other end of the spectrum, and more like cutting hair

with electric clippers, some growers use gasoline- or battery-powered shearing equipment with reciprocal blades that resemble long hedge clippers. These trimmers come in lengths of up to 6 feet and allow the operator to set the angle of cut and simply walk around the tree in a forward direction to produce very straight lines. Those growing pines may find this approach preferable. Then there also are shearing machines that take the form of string trimmers, but with a metal blade affixed.

You can have good results with any of these methods, so it is usually up to the grower's individual preferences as to which is the most efficient method for each farm. No matter what shearing equipment you use, it is always a good idea to carry along a small pair of hand pruners to remove extra tops or perform small touchups to trees.

Pruning and Shearing Tools

Basal Pruning

Early Christmas tree growers working with wild trees discovered that by cutting off the bottom branches — a process called **basal pruning** — they could stimulate a tree to grow more densely for the next few years. Basal pruning is still practiced to get a nice stem on the tree just below a good whorl of branches. Some growers recommend creating 1 to 1½ inches of bare stem for each foot of tree height. This procedure not only ensures evenly spaced branching at the bottom of the tree, but also makes the tree easier to cut and handle during harvest, easier for the customer to put in a stand, and creates a nice, neat appearance with plenty of room underneath for presents.

Basal pruning is hard work, often done on hands and knees.

Motorized basal pruners are used on some farms to make the job less arduous.

Shearing

More important than what type of shearing equipment is used is knowing when and how to use it. Perhaps the biggest mistake some new growers make is waiting too long to begin shearing their trees. Regardless of species, it is a mistake to delay shearing until the tree is 4 or 5 feet tall. At that stage it is difficult to coax it to “fill in” or “tighten up,” and even if it does get bushier on the outside, it is likely to look hollow in the interior.

Instead, start to shear lightly when the tree is about 2 feet tall. Each year after that, increasingly heavier shearing will be necessary to get the tree into the tight form and tree shape you want. Some growers will then try to shear very lightly the season before a tree is expected to sell, helping to ensure it has a more natural, organic look rather than the harsh lines of a tightly sheared tree.

Pines grow more rapidly and, depending on the type of pine and area of the country, may require twice-annual shearing. Firs and spruces typically need shearing only once every year.

Trees are programmed to grow. Shearing, when done at the right time, makes the best use of that tendency. Shearing checks the natural upward and outward growth of the tree and the tree responds by sprouting new buds between existing branches, causing growth where it would not otherwise have taken place. Since the growing season of most conifers lasts only about four to six weeks (the timing varies depending on species and region of the country, but generally takes place from May to July) the optimal shearing window is short. Though it is not absolutely necessary, shearing during the growing period allows enough time for the redirected growth to take place before the season ends and it also enables the cut ends to heal over and form new terminal buds that will sprout and grow the following year. Trees sheared during this window heal so effectively there is little evidence that any shearing has taken place.

Proper position for using shearing knife.

Shaping and Shearing, Step by Step

Pay most attention to getting the top correct, and then you'll need less heavy cutting on the lateral (side) branches. The goal is to shear in a way that promotes good bud development, both on the terminal and lateral branches. Here's a standard approach.

1.

Select the strongest, straightest, most central "terminal leader" and remove all other competing tips.

2.

Depending on the height of the tree and the species, cut the leader at around 12 to 14 inches, at most. Generally this length decreases as the tree matures.

3.

Cut the top whorl of branches about two-thirds the length of the leader.

4.

Continue that angle downward to the rest of the tree

Pines typically need to be sheared early in the growing season, and are nearly impossible to force into a good shape if they are pruned at the wrong time. Spruces and firs can be sheared at other times of the year, but the new growth becomes harder (and more difficult to shear), and it becomes more difficult to correct problems with multiple leaders and irregular growth, particularly on the tops of trees.

Proportions

While tastes vary (some like a wider tree, others a thinner tree), the standard shape is considered a "two-thirds taper." For example, on a 6-foot-tall tree, the width of the base would not exceed 4 feet. Keeping

this basic ratio in mind will help you produce trees that are acceptable to the widest range of customers, and pretty soon the two-thirds taper will become second nature to you and won't require any thought when shearing.

That said, there are different theories on shearing, and also differences between the approaches required on pines versus firs and spruces. It will help you to become a good shearer if you work with or first observe experienced shearers at work, and understand why they are making decisions on where to cut.

Some trees naturally will be inclined toward the correct shape and shearing is mostly to help make the tree dense. But lots of trees have different growth paths. Some will have a tendency to be too tall and thin; others might be too short and fat. At its essence, shearing is about working with each individual tree to try to rein in those tendencies as much as possible. Shaping a tree is difficult to learn from a book, but it will help always to keep the normal shape of the species in mind. Spruces and firs grow naturally into the shape of a slender pyramid; pines are more spreading, so a slight, archlike bulge at the middle looks natural, but be careful not to create a house-roof effect with sloping sides on the top half of the tree and near-vertical sides on the lower half.

Especially when using a knife, odd shapes can best be prevented by shearing in one long sweep from top to bottom as you go around the tree, instead of first shearing the top half and then the bottom. This technique is more efficient, too, because by circling each tree only once, a lot of time and mileage is saved during the course of a day.

Although a premium tree should be a tight specimen, your goal should *not* be to produce one as thick as possible. When sheared too tightly, trees tend to develop thick stems that add considerably to the trees' weight and thus to the difficulty of transporting and mounting in plant stands. Too much density in a pine traps a huge amount of old, dead needles in the interior that are difficult to shake out when they are damp, but which are almost certain to dry out later and then drop onto the living room rug, greatly tempting the customer to shop for an artificial tree the following year.

Prune pine trees to a slight archlike bulge in the middle, according to their naturally spreading shape; prune firs and spruces to their slender, pyramidal shape.

Avoid too-wide or house-effect shapes by shearing in one long sweep from top to bottom as you go around the tree.

Taste Plays a Role

As with other fashions, tastes in trees change. Shaping methods must be adapted to what the public wants. For example, lighted candles, which were popular during the early part of the twentieth century, required a loosely branched tree, but electric lights make no such demands.

Tastes in trees vary also from place to place — and person to person. Some prefer a tightly sheared look; others like a tree that's a little looser and more natural looking. A grower should investigate what is preferred in his marketplace before deciding how to shear. Those who sell retail or operate a choose-and-cut farm need to offer a variety of shapes and sizes so their customers will have a good choice, but wholesalers usually prefer loads of trees that are fairly uniform in size and shape. Visiting other Christmas tree farms in your area and talking with other nearby growers can give you valuable insights about the types of trees that they see the strongest demand for. Some local fairs and farm shows include Christmas tree competitions, which can give you a chance to see different styles of trees side-by-side and hear what potential customers think of each.

Late-Season Touch-Ups

After the shearing job is completed, take frequent walks through the plantation throughout the remainder of the season with knife or pruners in hand. Late growth, or a missed extra top or branch in the

wrong place, should be removed.

There is certainly a satisfaction in shearing because the change in appearance of the tree is dramatic and the results are instant — no waiting months or years for delayed gratification. As the great horticulturist Liberty Hyde Bailey once said, “Of all the operations connected with horticulture, pruning, shaping, and training bring the person into closest contact and sympathy with his plant.”

When Things Go Wrong

Any enterprise that involves living things can be full of surprises.
Christmas trees are no exception.

Whither the Weather?

Some years, conditions are perfect for growing, with mild temperatures and ideal amounts of sun and rainfall each week. Those years, we treasure. But weather isn't always made to order.

Extended droughts, in particular, can wipe out entire new plantings. Even those who can afford to irrigate might not find enough water available.

Winter cold by itself seldom bothers conifer species that are suitable for the area, but ice storms can damage even the hardiest. Pines, especially, can be badly damaged when a hard frozen crust forms on top of deep snow, then settles as the snow melts from beneath. The crust rips limbs from tree trunks as it sinks. Alternate freezing and thawing in years with little or no snow cover can heave young trees of any species out of the ground, drying out their roots.

Winter burn — browning of needles — occurs when winter winds evaporate water from the trees' needles faster than it can be replaced by the roots, especially when the ground is frozen for long periods or when the trees are growing on poor soil that tends to be dry. Minor damage disappears as it becomes covered with new growth, but severe windburn may deform or even kill trees.

Along with winter burn, another culprit is salt. Once it was only trees planted near the seashore that were damaged, but now those growing close to highways where traffic kicks up road salt in winter can suffer, also. The fact that wind carries this salty spray for considerable distances is strikingly obvious along heavily traveled northern highways every spring. Evergreens can also be damaged when salt-laden snow melts and drains onto their roots. These conditions are difficult to control in vulnerable areas, so it is wise not to plant trees where salt damage is likely.

Spring doesn't end the weather problems. Late-spring frosts are a common complaint of tree growers nearly everywhere. As often occurs, a few warm days stimulate the trees to start growing, and then a freezing night comes along and all the tender new growth is killed.

The tree will live, but all new growth for that season is lost, and the next year a major shearing may be necessary to get the tree back in shape. It helps to avoid planting in pockets where cold air is likely to settle, but your best insurance is to plant only species that break bud late, hopefully after the last spring frost has struck.

Plant Stress

Like humans, plants suffer from stress. Weather extremes make them more susceptible to attacks by insects and disease. Trees sometimes appear to have survived flood, drought, or cold, and then succumb a few weeks later. They have simply become too weakened to absorb the needed nutrients and convert them to plant tissue.

Stress can be caused by circumstances other than weather. Heavy rainfall can weaken trees, as can too much competition from weeds. Certain soil conditions also contribute to stress: excessive wetness, acidity, or alkalinity; deficiency in necessary trace elements; or an excess of aluminum. Damage to the bark caused by deer, rabbits, mice, or mowers can be devastating. Stress can also be caused by too much or too little fertilizer, improperly used herbicides or insecticides, or pruning off mature branches during the spring when the trees tend to bleed badly.

Taking Action

It may be tempting to reach for a chemical solution immediately at the first sign of a sickly looking plant, but don't load up the sprayer unless you know for sure what's wrong. Rather, follow an Integrated Pest Management (IPM) approach, which means first taking the time to determine what is causing those dead needles or drooping new growth. Many tree disorders are physiological, and rather than indicating the presence of a serious disease or insect pest, the condition could be a symptom of stress caused by any of the factors described previously. When you are certain it is not an environmental problem, look for tiny eggs or larvae of insects, or the fruiting bodies of disease (spores, rust, molds), to positively identify the culprit(s). Only then can you decide on the course of action.

To help in your identification, invest in a good quality hand lens and a comprehensive identification guide (or online Extension

website) with good, clear photos in order to confirm exactly what you're seeing. Consult an expert when in doubt. Elsewhere in this book we have listed the more common diseases and insects that affect trees, but literally dozens more could appear. Some are widespread, but others are specific to certain areas. Some affect many different trees species, while others come only in cycles, say every seven years. Fortunately there are plenty of Extension service websites and other online resources to help you pinpoint the problem and understand treatment options if necessary. The last step is to determine if the level of damage is something you can tolerate, or whether it crosses a threshold where control is required.

As with herbicides, there are too many insecticides and fungicides on the market to review them all here. Some of these products are also restricted use and require a license in order to apply. Read all pesticide labels carefully before buying them to be sure that the product is safe to use on trees and recommended for the pest affecting your planting. For example, some fungicides control only certain diseases but not others. And insecticides that kill weevils are not always effective on mites.

Correcting Poor Tree Color

Buyers will not be interested in your trees unless they look healthy. Unfortunately, trees that have been green all spring and summer sometimes mysteriously turn yellow just before sales season, even when there are no insects or diseases present. This condition may be the result of natural fall coloring, as is common with some strains of Scotch pine. It can also be a result of nutrient deficiency when a tree runs short of food just when it should be storing it up for winter. A rainy summer may leach away the fertilizer, or heavy weed growth in late summer may also rob the trees of nutrients. Some growers will apply a little extra nitrogen to only those trees that will be cut that year in the fall. The color should improve by harvest time.

If fertilizing doesn't help, it may be necessary to spray a tree colorant a few weeks before harvest. These green dyes are especially formulated to be absorbed into the needles of evergreens. They look natural and will not wash off. Colorants are available from most Christmas tree suppliers and can be applied with almost any type of sprayer. Follow the manufacturer's application instructions for best results.

Sales Strategies

If Christmas tree planting, shearing, and other cultural methods have been done perfectly for years, but the final step — selling — goes wrong, all the time and work will have been wasted. Yet, sadly, it is at this point that a great many producers fail.

Some things about the business are out of our control and difficult to anticipate. Whether you are selling trees as choose-and-cut on your farm, at a retail market, or wholesale in large quantities, challenges can arise. Markets can become oversupplied, extremely wet weather or heavy snows can hit during the harvesting season, a competitor could undercut your price, and so on. What you can do is make sure you have a plan to harvest and sell your trees that takes into account some of these variables.

Most aspects of marketing are within our control, and by planning ahead it is possible to harvest successfully and sell all the good trees you are able to produce year after year. The first step, which should be taken long before your trees reach marketable size, is to decide how you want to sell your trees. The three basic approaches are wholesale, retail, and choose-and-cut. Many growers choose a combination of these.

Wholesale

Wholesale selling can take many forms. The easiest, even though it's at the bottom of the merchandising ladder as far as revenue is concerned, is to sell the trees "on the stump": The buyer selects the trees he or she wants, then cuts, wraps, and takes them away. This method of selling is recommended only as a last resort for several reasons. Not only are the prices you receive much lower, because the buyer is performing the work of harvesting the trees, but buyers will cut only the best trees, and could damage the others and leave a mess in the field, as well. Unless you work right there with the buyer, you must accept his or her count, also, so there is ample opportunity to be fleeced on the number of trees taken.

Choosing, cutting, and wrapping the trees yourself is a more common approach to selling wholesale. The prices are better, as is your control over the harvesting. In some cases the seller arranges for trucking; in other cases it is the responsibility of the buyer. Be sure these details, as well as specifics regarding the number and grade of trees being purchased, and at what price, are put in writing beforehand. Most wholesale growers require a deposit upon order and full payment before the trees are released.

Large producers sometimes sell their trees to a distributor who subsequently wholesales them to nurseries, florists, shopping centers, or filling stations, or to seasonal retailers who sell on vacant lots or from the back of a truck. Some growers prefer to omit the middleman and sell their trees directly to these retailers. This sales method is another step up the selling chain and can be more profitable, but adds more responsibility, labor, and time, and often the job of collecting the money from many customers becomes more difficult.

No matter what type of wholesale selling you do, it is important to line up your buyers early each year, even if you aren't sure of the number of trees you will have and must estimate on the low side. Most sales are made before July. Many growers make their sales contracts even a year ahead. Anyone who cuts thousands of trees,

piles them beside the road, and expects a buyer with a wad of money to appear suddenly in November is probably not going to spend the winter in Bermuda. The wholesale business requires a lot of preliminary legwork to line up new customers and there's no certainty that even buyers you have supplied for many years will let you know if they decide to get trees from another source, either, so it is important to insist on a deposit every time.

Fortunately, there are more avenues for wholesale growers to market their trees and attract buyers now than there once were. For example, many state Christmas tree associations and other industry groups offer wholesale buyer's guides, which let growers create online listings to describe the type and number of trees they have available.

Retail

Retailing directly to the customer is the top of the sales ladder as far as profit goes. The price per tree may be more than triple over selling it wholesale, but the risks also greatly increase. Collecting the money is not usually a problem, but weather, competition, and other factors may leave you with many unsold trees.

There are many ways to market trees directly to the consumer. For instance, you can rent a corner of the parking lot at a shopping center, take a load to a city and sell on the street (with added costs for permits, security against tree theft, housing for employees, and so on), or join forces with a landscape nursery to sell at their facility.

Wherever you set up your lot, it is important to stand your trees up neatly on end by leaning them against racks rather than having them thrown in a heap. There also are newer systems on the market that allow trees to be stood straight up by drilling a hole in the butt of each tree and sitting it on a pin of the same size. This makes selection easier for customers, and trees are more attractive when they are not crushed in a pile. Prices should be prominently displayed on weatherproof tags.

To encourage customers, make everything as comfortable and easy for them as possible. The nature of the business means you must be outdoors so the trees will be in a cool environment, but you can plan the layout of your selling area so that it is sheltered from the wind (and, in warmer climates, the sun), and parking and pickup are easy. Provide windbreaks and shelters and perhaps even hot chocolate and coffee if your clients come from long distances. A long measuring pole can help customers accurately gauge how tall each tree is in comparison with their living room ceiling.

Try to make the checkout fast and convenient so customers won't be kept waiting. New mobile technology is allowing Christmas tree growers to accept credit or debit card payments even at remote lots. Provide helpers to answer questions, wrap and carry the trees, and help tie them to cars. If you have only a few dozen trees to sell, these

won't be major considerations, but with a larger operation, they can be vital. Unfortunately, sales must all take place within a few weeks at one of the coldest times of the year, so be ready to use any legal means to lure customers into your lot instead of someone else's or to prevent them from driving to the mall for an artificial tree.

In addition to trees, many retailers (and choose-and-cut operators) sell other products to generate a little extra revenue, such tree stands, wreaths, centerpieces, and decorations.

If you plan to be open nights, arrange good lighting for the lot and your advertising signs. Don't overlook liability insurance. Your agent should be able to write a policy that will cover you only during the weeks your lot will be in operation.

Choose-and-Cut Operations

Like pick-your-own berries, cut-your-own trees have become a popular way for farms to merchandise their products. Tramping through a plantation is much like going out in the wilderness to cut a tree. Families with children especially enjoy making this ritual part of their holiday tradition. Many bring their cameras or photo-taking smartphones, and may even include an outdoor winter picnic. People also like the fun of searching for the perfect specimen from a large selection of farm-fresh, well-spaced evergreens.

To be successful, a choose-and-cut operation must be located where there are enough customers within driving distance to match the number of trees available. The planting should be accessible to the road, easy to find, and include plenty of parking space located so that customers won't need to carry their trees a long distance. Some growers plant blocks of trees in consecutive years along roadsides, so that each year a new block will be ready near a parking area. Others prefer to plant new trees each spring where the mature ones were cut the previous fall. Such plantings are appealing because the trees are more natural looking, with all sizes growing together. Unfortunately, in such lots the customers sometimes inadvertently damage small trees, especially when the trees are partially snow-covered.

You will have to develop your own method of pricing. The simplest way is to ask the same price for every tree. Another method is to charge by the height or species of the tree. Some growers let customers tag trees early in the fall for later cutting. This can help attract new customers, but it can also lead to complaints about tag switching, as well as the inescapable feeling that the best trees had already been reserved. Other problems include taggers who are no-shows later in the year when it's time to pick up — and pay for — the tree.

Not much harvesting equipment is needed for this type of operation, although most growers provide bow saws for their customers. A warming shelter and hot drink are welcome additions to

a cut-your-own lot. Also, you may want to have a salesperson standing by to help customers shake the old needles out of the tree if pines are sold, and to tie the tree onto the car. Extra services like these will help make the tree cutting a pleasant experience your customers will want to repeat.

Some choose-and-cut lot owners even provide rides to distant fields in horse-drawn sleds complete with sleigh bells or in a trailer pulled behind a tractor. Such junkets are fun, but because they take extra time during a busy season, the costs of such additional services must be added to the price of the trees. Because of the higher accident risk, insurance costs will likely be more, too.

One big plus for a choose-and-cut operation is that if business happens to be bad any year, the unsold trees remain growing in the field, available for the next Christmas season.

Grading and Tagging Trees

Regardless of how you choose to sell your trees, inventory management is crucial. That means knowing how many trees you have to sell in a given year, as well their quality and size. After the trees have been sheared, tag the ones you want to sell later that year. That way, you will know exactly how many of each species, size, and quality you have to sell, and can confirm your wholesale orders accordingly. If you sell your trees at retail, you'll also want to know in advance how many of each size you will have available. For starters, this gives you a sense of how many trees you have available to sell. If you undersell, you will leave money on the table and end up with too many large trees in your field the following year. If you oversell, you run the risk of having too few trees — and disappointed customers — in future years.

Beyond counting the number of trees, wholesale growers (and some selling choose-and-cut) need to assign each a **grade**, or quality. The following factors determine the quality of a Christmas tree:

- general appearance
- the degree to which its form is well shaped and symmetrical
- taper
- needle color
- health

The United States Department of Agriculture has established a grading system for Christmas trees and a few states have adopted it or a similar system. Three grades are suggested:

Premium. A tree must be nearly perfect.

Number One can have one less-than-perfect “face,” but the other three sides should be of high quality.

Number Two can have either a slimmer or fatter taper than a Premium or Number One, and only two sides need have a good appearance. These are often called “corner trees.”

Cull, of course, is a tree that doesn't measure up even to Number Two.

Although these grading standards were established many years ago, grading of trees is not enforced and is done mostly on a voluntary basis. To avoid upset wholesale customers, be sure they have an understanding of the grading system you are using and what type of trees they will be receiving.

Growers should concentrate on growing only high-quality trees, of course. They are the ones that bring you the most satisfaction and the highest profits. But no Christmas tree farm can grow only premium trees. Besides, there will always be buyers — especially in the choose-and-cut market — who prefer trees that are less than perfect, or less expensive.

If you sell more than one grade of tree, use different colors of plastic ribbon (flagging) to mark each tree as you go through the field. For the sake of your reputation, don't go easy on the grading. No one wants to buy an ordinary tree with a premium price. Keep a precise tally of the count. A rough estimate is not good enough, because during a casual walk through a planting most trees have a way of looking very good. It is only when you begin to carefully evaluate and put tags on the premium specimens that the number shrinks considerably.

Check the trees again throughout the season to make sure that disease or insects are not damaging them and that the color stays good, so that your grading remains accurate.

Trees are also often tagged according to their size as well as grade, which makes it easier to sort trees at harvest time and let buyers know what you have available.

Pricing

Deciding how much to charge for trees is difficult, even for long-time growers. Unfortunately, in both retailing and wholesaling, the prices charged by the competition usually determine the price you can ask. You can mark your trees at \$50 apiece, but if the seller across the street is selling equivalent trees for \$30, your sales are likely to be slow. Membership in your state Christmas tree association is a great way to talk with other growers and get a sense about current pricing in the industry.

Part of what determines pricing is the supply of trees available. While local retail or choose-and-cut markets might be more stable, wholesalers must react to what is happening in neighboring states, and even in other parts of the country. A glut of trees far away may mean more will be shipped into your target market, lowering prices that buyers are willing to pay; a shortage somewhere might open up an opportunity for you to truck trees into new markets for a higher profit. Unfortunately the long lead time required from planting to harvest makes it difficult to quickly react to changes in the larger marketplace.

If you do plan to ship your trees long distances, be aware that there may be applicable state and/or federal quarantines aimed at restricting the spread of certain insects and diseases. Be sure to check with your local Extension office in plenty of time to allow for any phytosanitation checks that may be required.

It is important, in any case, long before trees are sold, to know what your production costs have been and how much you must charge to make a fair profit. Try to be reasonable. Cutting prices to get business hurts the entire industry and inflating prices when trees are scarce speeds up the sales of artificial trees.

Online Mail-Order Selling

A relatively recent development, made possible by the Internet, is to sell trees online. Customers can select the size and type of tree they want and have it shipped directly to their home by UPS or FedEx. This method of sales requires an e-commerce website, as well as specialized equipment that can compress and pull trees into heavy duty cardboard cartons. Follow any state regulations about inspection (called phytosanitation certification) of trees or wreaths leaving your state. Price your trees and wreaths realistically, but realize that in terms of labor, materials, shipping and so on, your expenses will be much higher than if you were selling them off a lot.

Time to Harvest

Like most farm operations, tree harvesting must be done at precisely the right time. Unlike crops such as strawberries, grapes, and asparagus, however, Christmas trees cannot be processed, stored, and sold at a later date.

In the north, trees should not be cut until their new growth has been hardened by a few days of freezing weather, and in the south not until the danger of prolonged periods of severely hot weather is over. For wholesale sellers, the harvest season may begin as early as mid-October in the northern mountains, but a month or more later in warmer regions. Anyone who tries to lengthen the harvest period by cutting a few weeks too early usually regrets it. Many growers have forfeited future sales by furnishing buyers dried-out trees. The later in the season that trees can be cut, the fresher they will be for customers. Wholesale buyers usually control when they want trees delivered or ready for pickup. Once trees have been harvested, every effort must be made to keep them in a cool, shaded area rather than sitting out in the sun and wind. Some farms sprinkle the cut trees with water to prevent them from drying out.

Selecting Harvesting Equipment

Because it will be several years after planting before you need harvesting equipment, this purchase can be delayed for a while, and this will give you time to select what is best for your operation. Even on small wholesale operations, chainsaws are necessary because they are faster and need less muscle power than bow saws.

Most choose-and-cut operations provide their customers with bow saws, rather than allowing use of chain saws. Bow saws are quieter, safer and lighter for customers to use out in the field.

One of the more muscular jobs in harvesting comes in getting the trees from the field to the loading area, and it may take several workers to keep up with one good cutter. Lightweight trees can be carried by hand and heavy ones can be safely dragged over snow-covered ground, but never pull large trees long distances over rough, bare ground. Such treatment is likely to scrub off bark and needles and ruin their appearance — another good reason for having plenty of access roads. Unless you are selling choose-and-cut, some combination of truck, tractor, and/or trailer will be needed.

Plan your operation so tree handling can be kept at a minimum. Handling costs money and can be hard on the trees, so the closer the truck or trailer can get to the growing area, the better. This is a consideration not only for wholesalers, but also choose-and-cut farms where the trees are a long distance from the parking area. Some farms in this situation offer wagon rides to get customers and trees back and forth.

Larger operations — whether wholesale or retail — will need a motorized tree-tying machine; these devices can wrap trees in twine quickly and tightly, making them easier to handle and ship. Most wholesale buyers require that trees be wrapped because loose trees take up much more room on a truck and are more likely to be damaged in handling. (Wholesale sellers will also likely need a conveyer to pull the trees to the top of a large truck.)

Retail customers may request that trees be wrapped to make them easier to transport home and bring inside. Smaller choose-and-cut farms might prefer a less-costly manual tree wrapper, most of which use plastic netting to package the trees. Each tree is slid, butt first, through a cone of the right size, picking up the plastic wrapping from a sleeve as it emerges from the cone. Before wrapping, some growers prefer to remove any dead needles (or leaves, grass, or other debris accumulated in the field) by placing them on a mechanical tree shaker, which resembles an oversized paint can shaker. The more needles that can be removed prior to ending up on a living room floor, the happier customers will be, and therefore more likely to be repeat customers.

Wrapping a Tree

Wrapping is an absolute necessity for wholesale sellers, and it's a popular touch with many customers in choose-and-cut and retail settings. There are three basic types of tree wrapping devices. The first is a motorized, mechanical type, such as the Howey baler, which pulls the tree through the unit, automatically compresses it, and wraps it tightly with twine.

The other two are manual wrappers, which offer less compression of the tree, and thus are less likely to be used by wholesalers interested in getting as many trees on a truck as possible. The first (less common) operates similar to the power baler mentioned above, but the operator must manually pull the tree and wrap the twine around it himself. The more common manual type involves a cone with plastic netting mounted on it. The operator manually pulls the tree through and it ends up encased in the netting (like a sausage).

Both the twine machines use a special plastic (manmade) twine rather than natural sisal baling twine for strength. With the netting, though maybe not as common, there are options that are marketed as recyclable or biodegradable.

2 Ways to Wrap a Tree

Motorized wrapper. *A gasoline-powered machine spins the tree while wrapping it in baler twine.*

Manual wrapper. *Pull the tree, butt-end first, through a*

sleeve that dispenses the plastic netting.

Wreaths and Greens

Greens — wreaths, centerpieces, garlands, etc. — are an excellent sideline to the Christmas tree business; in fact, some growers find that greens and wreaths are more profitable (on a per-unit basis) than their trees. In smaller quantities, at least, these festive accessories can be made with very little investment in equipment and supplies. And tree growers have an advantage because they tend to have a ready supply of the branches needed to produce wreaths, centerpieces, and the like.

Some farms basal-prune their larger trees' lower branches in October or November in order to have greens (brush) for wreath-making. The work has to be done anyhow, so it makes sense to do it at a time when you can use the cut branches. And sometimes cull trees (those not good enough to sell) can still provide fine foliage for making greenery products.

Firs and pines are the species most often used for wreaths, either separately or in combination. Spruces are too prickly, which makes them difficult to fashion into wreaths and roping; cedars, yews, and junipers are less useful because most tend to lose their rich green color in early winter. Where they grow well, other popular materials for adding a decorative touch to holiday greens are the broadleaf evergreens such as bay, boxwood, holly, and laurel.

Preparing Materials

Trees need near-freezing temperatures to “harden” the needles so they won’t fall off a few days after the branches are cut, so cutting cannot begin until it has become cool. A cool, rainy fall is ideal for producing high-quality greens. Windy days, as well as warm, sunny weather, can dry out and ruin cut greens quickly, so store them in a cool, sheltered, shady spot, and sprinkle them occasionally if necessary. Don’t pile them over 3 feet high or the bottom ones will be crushed. Cover them with burlap, branches from unusable trees, or a similar material, but not plastic because it can cause the greens to get hot, ferment, and spoil.

The Wreath Business

Many crafters make only a few wreaths to sell locally, while some large, commercial wreath-making enterprises employ large numbers of wreath-makers who work together in large factory-like assembly lines. Many Christmas tree farms that make and sell their own wreaths fall in between these two extremes.

Supplies

Order your supplies long before the wreath-making season begins and there's a rush on supplies. Good-quality hand pruners are most important. Crimped wreath rings come in a variety of sizes from 8 to 24 inches in diameter, and smooth heavy rings are available in even larger sizes. The 12-inch ring is the most common, and a good, finished, double-faced wreath made on it should measure about 18 inches in diameter and weigh from 4 to 5 pounds. The 8-inch ring should result in a wreath 14 inches in diameter; the 16-inch ring is used for one of 24 inches, a 20-inch ring for a wreath of about 28 inches, and one on a 24-inch ring should have a diameter of about 34 inches.

Winding wire is usually purchased on half-pound spools, in 22-, 23-, and 24-gauge sizes, and in either natural wire color or green. Green is popular because it is less visible on the wreath or roping. Many wreath-makers producing average size wreaths use the lightweight, 24-gauge size, because more wreaths can be made per spool.

You'll need to order heavy string or baler twine to tie up the bundles unless your buyer wants them loose so he can inspect each one. Wreaths were once sold by the dozen, and six were tied in each bundle. Five in a bundle is more common now, and it's much easier to count them.

If you decorate wreaths, you will also need ribbons, cones, wired picks, and berries (either real or ersatz). The addition of a bow and a few cones and berries can more than double the price of your wreath if you sell wholesale, and if you retail, the percentage of mark-up will be even greater.

Tastes in wreath decorations vary a great deal, so it is wise to check what your buyer has in mind before you decorate. Some like only a large red or gold ribbon; others prefer only natural decorations, such as cones, pods, nuts, dried flowers, or berries. Specialty and craft catalogs are full of other mass-produced decorative items that can be

added to wreaths.

Single or Double?

Single-faced wreaths, made by wiring the greens on only one side of the ring, are suitable for hanging on a wall or door, or to use as a centerpiece. Double-faced wreaths, with greens on both sides of the ring, are preferred by most people because they are bushier and can hang in windows.

Since the upper and lower sides of greens such as fir, holly, and boxwood look quite different, they must be “faced” when placing them on the ring so the pale side won’t show. Pines look the same on both sides, so facing is not necessary.

Wreath-Making by Machine

While wreaths can be made entirely by hand (see **How to make a wreath by hand**), many larger producers opt to use a wreath-making machine. There are two types to choose from.

The first uses a special type of ring with clamps surrounding the perimeter. The ring is placed on a special table and a handful of greens are laid on the ring. Then, when the operator presses a foot lever, one clamp is bent over, tightly fastening the greens in place. This process is continued around the ring until the wreath is complete. Because this machine is simple and no electric power is needed, it is inexpensive. Rings of a special type are required, however, which are more costly than the simple corrugated ones used for making hand-wired wreaths.

The other type of machine is more complicated and expensive. It is powered by an electric motor, uses winding wire and ordinary rings, and the process duplicates more closely the making a hand-wired wreath. A bunch of greens is held against the ring, then a foot switch turns on the power, and a spool of wire rotates around the ring, wiring the greens to it. By alternating the placement of the bunches, the operator can make a double-faced wreath. The machine can also be used to make garlands by wiring small bunches of greens onto a heavy string.

Wreath-Making by Hand

Your workspace should be cool to keep the materials fresh, with good natural light so the greenery colors are clearly visible.

How to Make a Wreath by Hand

To make a wreath by hand, follow these steps:

1.

Wind a few twists of wire around the ring to fasten it securely.

2.

Place a bunch of two to four tips of greens on one side of the ring and wire the base of the bunch to the ring with two or three tight wrap-arounds. Select some good bushy greens for this first bunch, because it must hide the base of the last bunch you'll insert. If you are making a double-faced wreath, flip the ring over, and wrap a similar bunch onto the back side. Place it almost, but not quite, opposite the first one.

3.

Lay another bunch of greens over the base of the first, hiding the wire, and wire this one to the ring. Continue in this fashion, moving around the ring and placing all the greens on one side if it is a single-faced wreath or flipping it for each bunch if it is a double.

4.

When you reach the spot where you began, tuck the base

of the last bunch underneath the tops of the first that you wired. Wire it in carefully, so neither the stems nor the wire show.

5.

Cut or break the wire and fasten it tightly with several twists to one of the wires or to the ring itself.

A Few More Wreath-Making Tips

- Whether you start around the wreath clockwise or counter-clockwise, always do it the same way each time so it will become a habit. Consistency will add greatly to your speed and soon you will make each movement automatically without thinking about it.
- As you work, vary the size of the bunches if you notice that the wreath is becoming too heavy or light. If it appears floppy, you may be placing the bunches too far apart on the ring or you may be wiring too close to the cut ends of the twigs. If the wreath is not shaping well into a round form, use shorter lengths of greens.
- If you have some greens that are less than perfect, don't throw them away unless they are really bad. On a double-faced wreath you can wire a piece at the back of a bunch now and then, and if done carefully it won't show, but will add bulk to the wreath.
- Tie each bundle as soon as it is finished and immediately move it to a cool, shady place out of the wind.

Conclusion

Keep abreast of what is happening in the constantly changing world of Christmas trees. Government regulations concerning taxes, chemicals, and quarantines frequently change. So do cultural tastes and market demands. To keep up to date, join your area Christmas tree association (and visit the National Christmas Tree Association website, www.realchristmastrees.org) and attend their meetings. Subscribe to Christmas tree newsletters and magazines, read the bulletins published by your Extension service, and attend any meetings they sponsor that pertain to the growing and marketing of trees.

As advised throughout this book, it's a good idea to talk with experienced growers and visit their farms to see what kinds of trees they're growing, and how they're doing it. When you decide to go ahead with your own operation, give yourself plenty of lead time to allow for soil tests, to get the equipment you'll need to get started, to place an order for planting stock with a nursery, and to make a plan for your business.

The lists of dos and don'ts may seem overwhelming at first, as in any new project, but taking things one step at a time makes the process manageable. If you've read this book, you now know far more about growing trees than most of us did when we started. There is no reason why you, too, can't have great success. Hopefully you'll enjoy being involved in this great industry as much as we have.



Caring for a Real Christmas Tree

Care for a natural Christmas tree as you would a fresh bouquet of flowers. Before setting up your tree, make a fresh, straight cut across the trunk, at least 1 inch up from the base. Immediately place your tree in a water-holding stand, or, if you are not ready to decorate it, in a bucket of water. Don't let the base of the tree dry out or a seal will form and a new cut will be necessary. Check the water level daily. A fresh tree can absorb several pints to a gallon of water each day.

Fire safety. A Christmas tree likes it cool and safe, so don't place it near your fireplace, woodstove, heat source, or television set. Before decorating, check that the light cords and connections you use on your tree are in good working order. Unplug the lights when you go to bed or leave home.

After the holidays a Christmas tree has many uses:

- Place it in the garden or backyard and hang orange slices to attract birds, who can find shelter in the branches.
- Remove the branches and use them as mulch in the garden.
- Strip fir tree foliage from the branches and snip it into small pieces to stuff into aromatic pillows.
- Use trees as sand and soil erosion barriers.
- Sink a tree into a fish pond to provide refuge and feeding areas for young fish.

■ Carve wooden items from the trunk.

Source: The National Christmas Tree Association

A Christmas Tree Grower's Calendar

Each situation is different, but this seasonal calendar will give you a general sense of the tasks that must be completed throughout the year, and approximately when the jobs should be done. Each job listed doesn't need to be done every year, of course, and you will add chores of your own that aren't included here.

Winter (after Christmas)

- Review your records and make plans for the new year, including lining up workers if you will need them.
- Take inventory of fertilizer, pesticides, small tools, and office supplies. Order what you'll need for this year.
- Order seedlings and/or transplants, office supplies, etc.
- Do accounts, taxes, including sales tax.
- Update mailing lists of retail or wholesale customers.
- Remove culls and clear brush from plantings and roads.
- Complete any necessary equipment repairs.
- Attend winter meeting of your Christmas tree organization.

Early Spring

- Apply pre-emergent herbicides, dormant sprays.
- Fertilize established trees.

Late Spring

- Cultivate, mow, or spray around trees.
- Watch for insect infestations and take necessary action.

Early Summer

- Shear trees and continue mowing.
- Spray, as necessary, to control disease and insects.
- Begin to line up wholesale buyers for fall.

Mid- to Late Summer

- Check trees for aphids and other pests.
- Make preliminary inventory of salable trees.
- Continue grass, weed, and brush control.
- Plan advertising; order signs.
- Visit other tree farms, and attend your association's summer meeting.

Fall to Late Fall

- Check trees frequently for disease and insect damage.
- Watch for poor color and spray trees with colorants, if necessary.
- Get harvesting equipment in shape.
- Confirm the availability of your laborers for harvesting.
- Spread pre-emergent herbicides.
- Spray late summer brush control.
- Repair any road damage.
- Measure and tag trees for cutting and for choose-and-cut sales.
- Begin advertising for your retail or choose-and-cut operation.
- Put up your signs if they aren't up already.

November and December

- Take advantage of any free or low-cost publicity, such as newspaper articles about Christmas trees.
- Make/order wreaths and other decorations you intend to sell along with your retail/choose-and-cut trees.
- Cut trees.
- Set up your retail stand choose-and-cut operation, and sell trees!
- Deposit money, pay bills, and enjoy the holidays.

Glossary

Basal pruning. Removal of the lower branches of a tree, to create a stem for easier cutting and handling. Often used on tall wild trees to produce a salable tree high up on a stem.

Cast. Hue or color, referring to the tree's foliage.

Caliper. Diameter of the stump of a tree.

Cambium. The green layer between the bark and the sapwood of a tree where growth takes place.

Cover crop. A crop, usually grass or a grain such as winter rye, buckwheat, or oats, raised to build up organic matter and fertility in the soil and to choke out weeds.

Cull. An inferior tree.

Foliar. Pertaining to a tree's leaves or needles.

Grade. Quality (Premium, Number One, Number Two, or Cull) assigned to a tree for marketing purposes, based on its health and appearance.

Handle. The base of a Christmas tree's trunk.

Hardened off. Become woody in preparation for winter.

Humus. Partly decayed organic matter.

Late-breaking. Describes species whose new spring growth doesn't break out of the protective bud until after the major frost danger has passed.

Leach. Drain away plant nutrients or salts by water percolation.

Leader. The top branch of a tree that grows straight up.

Offshoot. A sprout growing from the main trunk near or just under the ground.

Peat. Organic material found in bogs, partially decayed, used to add humus and acidity to the soil.

pH. Method of measuring the acidity-alkalinity ratio in the soil. A pH of 7 is neutral. Most tree species do best on soils between 5.5 and 6.5.

Pruning. Cutting off woody portions of a tree.

Shearing. Removing the tips of branches to encourage a tree to grow into more compact shape.

Sod. Grass-covered soil.

Sprout. New growth on a plant.

Sucker. Shoot coming from the roots or lower stem of a plant.

Taproot. The main root of a tree.

Topping. Removing the top of a plant, either to control the height or to encourage side branching.

Transplant. A tree that has been grown for an additional year or more in a bed, before planting into the field.

Transpiration. Losing water through the leaves and bark of a plant.

Tubeling. A seedling that has been grown in a small container.

Variety. A subcategory within a species, in which seedlings inherit the unique traits of the parent plant, distinct from other varieties.

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